InBox / OutBox

Wall Mounted, PoE CobraNet Endpoint

User Manual

For Inbox X2, InBox R8, OutBox X2 and OutBox R8

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Revision 1.0

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614-00005-01

IMPORTANT SAFETY INSTRUCTIONS

The symbols below are internationally accepted symbols that warn of potential hazards with electrical products.

This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure -- voltage that may be sufficient to constitute a risk of shock.

This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read the manual.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Only use attachments/accessories specified by Attero Tech.
10. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus.
11. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
12. Use only 802.3af compliant devices for providing power to the units.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. Do not mount less than 1 foot above floor where liquids from cleaning services may damage the electronics.

WARNING -- TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

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Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and EN55022. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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1 – Overview

The InBox and OutBox CobraNet Audio Interfaces provide a cost effective and efficient way to allow CobraNet audio connectivity directly at the wall. They provide inputs to or outputs from any CobraNet system and are compatible with any standard CobraNet device. There are four different modules in the family. The InBox X2, OutBox X2 the InBox R8 and the OutBox R8.

InBox X2

The Inbox X2 features two XLR or TRS balanced inputs with switchable mic/line gain, +12V phantom power, and a clipping indicator for each channel.

OutBox X2

The OutBox X2 features two XLR balanced outputs.

InBox R8

The InBox R8 has 8 unbalanced line level RCA inputs. Each individual input is mono but these can be paired for stereo input as required. Mono and stereo inputs can be used simultaneously on the same device.

OutBox R8

The OutBox R8 has 8 unbalanced outputs. These can be used as mono outputs or paired for stereo outputs as required.

All of the units are designed to fit in a standard dual gang junction box and feature 802.3af Power over Ethernet (PoE) power, so all connectivity for both power and audio is provided by a single CAT-5 cable.

Each unit should be supplied with the following. If any of these items are not present, please contact your supplier:
1 x InBox or OutBox product
1 x Decora face plate
1 x Set of mounting screws
1 x Software CD

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2 – Installation

All InBox's and OutBox's are installed in exactly the same manner. They require the same fittings and wiring. The items that are required for installation include:

- InBox or OutBox product
- Set of mounting screws
- Decora face plate
- Low voltage back box (not supplied)
- Terminated Cat-5 cable (not supplied)

Warning: Do not mount the InBox or OutBox in a fully enclosed junction box. The enclosed space can cause an undesirable temperature increase. If there is no option but to use an enclosed junction box, it is recommended to cut several holes or knockouts for ventilation.

2.1– Wiring

Note: It is recommended that the cables be laid in place prior to installing the Inbox or OutBox product, as once they are mounted into the junction box there is no access to the Ethernet connection without removing the device.

The Inbox and OutBox products are PoE-enabled, so they receive their power over the Ethernet cable. This means the InBox and OutBox product do not require any additional external power supply. Only a single Ethernet connection on the rear of the unit is required and even with the additional requirement of PoE, are wired using standard Cat-5 cable and RJ45 connectors.

However, being PoE also means that the network infrastructure must support 802.3af PoE endpoints. All InBox and OutBox products MUST be connected to either a POE 802.3af compliant network switch or a high quality mid-span PoE injector.

Note: The maximum length of the cable from device to switch must not exceed 100m per standard Ethernet requirements.

2.2 – Wall mounting

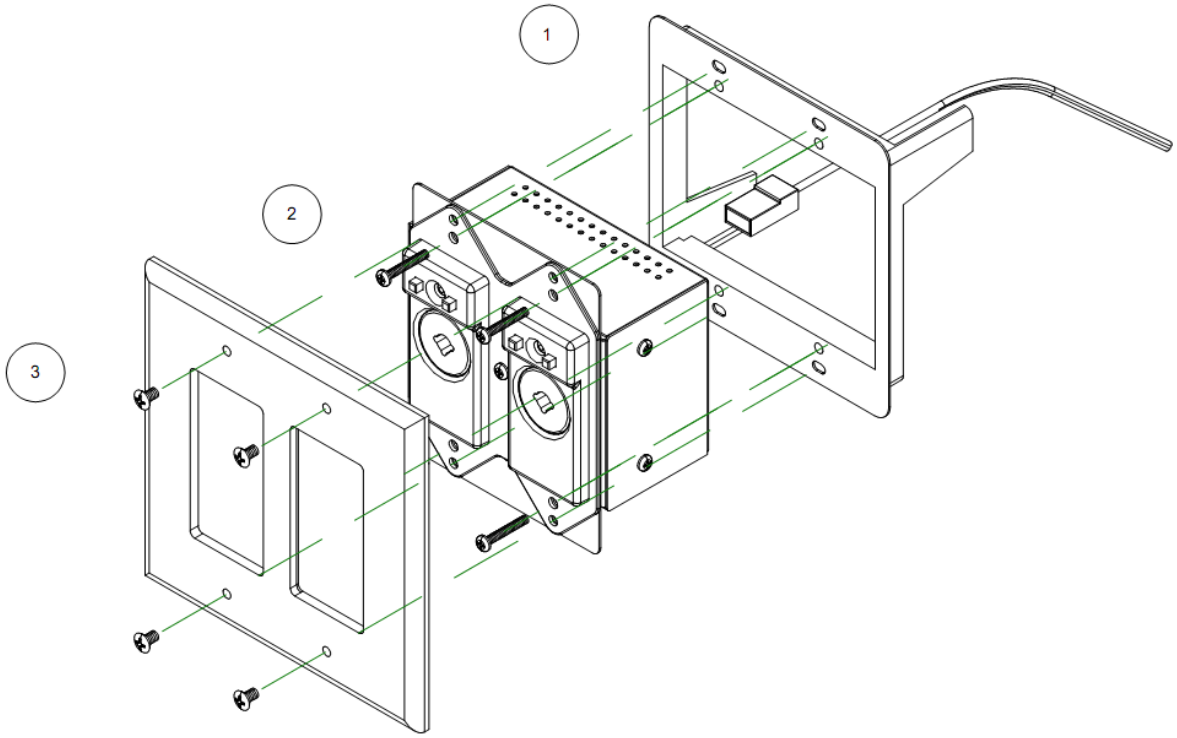

Figure 1 - Installation diagram

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Using Figure 1 above as a reference, follow these steps to install the product.

Step 1
A cut out in the wall will need to be made prior to installation. The cutout needs to be large enough to securely fit an Old Work Bracket such as the Carlon SC200RR (drywall mounting) or a Low Voltage bracket such as a Carlon SC200A (stud mounting).

Step 2
Connect the Ethernet cable to the RJ45 on the back of the InBox or OutBox product. Insert the device carefully into the wall bracket and secure with the 4 provided screws.

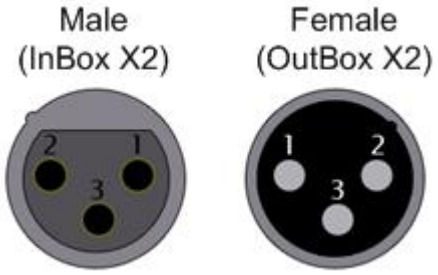
Step 3
Mount the Decora faceplate and secure with 4 screws

2.3 – Audio Connections

The inputs to either the InBox X2 or the InBox R8 can be mono or stereo. Any combination of mono or stereo inputs can be used. The outputs from the OutBox X2 and OutBox X2 can also be used in any combination of mono or stereo as well.

2.3.1 – InBox and OutBox X2

The InBox R8 uses a female connector. The connector is a dual type that accepts either an XLR male or TRS male connector. The OutBox X2 connector accepts only a female XLR connector only. Cable connections for all three types of connectors are shown below.



Pin	Function
1	Ground (cable shield)
2	Signal positive
3	Signal negative

Part	Function
(S)leeve	Ground (Cable shield)
(R)ing	Signal negative
(T)ip	Signal positive

The InBox X2 also has two externally accessible switches. Each switch is pressed to latch the switch in and pressed again to release it. The switch on the left enables or disables phantom power. Phantom power is enabled if the switch is in the “in” position. Phantom power is disabled if the switch is in the “out” position. The right hand switch is mic/line gain. Mic level is selected if the switch is in the “in” position and line level is selected if the switch is in the “out” position.

The InBox X2 also has a clipping LED for each input channel. The LED will show yellow when the signal is 6dB below clipping. The LED will show red if clipping occurs.

2.3.2 – InBox and OutBox R8

The InBox R8 and OutBox R8 both use standard RCA type audio connectors. Each connector is numbered. Use standard RCA cables and connectors to connect to the external audio equipment.

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3 – Audio setup

Audio setup of the InBox and OutBox can be done in various ways but all will involve setting up transmit and receive bundles by passing parameters to and from the device using SNMP[1]. Attero Tech provides the Control Center application for control and configuration of all InBox and OutBox products, as well as general SNMP control of compatible CobraNet devices. This application allows quick and easy setup of transmit and receive bundles and related parameters. For details on the parameters, refer to the Control Center User guide.

3.1 – Transmit Bundle Setup

When configuring a transmit bundle, keep in mind that for an InBox X2, only transmitter submap channels 1 and 2 are available. Sending a bundle with any other channels will result in a channel being transmitted with no audio content. When using the InBox X2, it is recommended that a single bundle be used for bandwidth efficiency. The bundle should contain both active channels and the subCount for that bundle be set to 2. This will cause the bundle to take up as little bandwidth as possible. For the InBox R8, a single bundle utilizing all the outgoing channels is the most efficient.

3.2 – Receive Bundle Setup

When configuring a receiver bundle, the OutBox X2 only utilizes 2 receiver submap channels. Thus only a submap value set to 33 and 34 will produce any output. The 2 channels can come from the same or different bundles, and it doesn't matter how many audio channels are actually received in the bundle as the unused audio can be ignored.

[1] SNMP stands for Simple Network management protocol and is a standard protocol used over Ethernet to control networked devices.

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4 – Troubleshooting

List below are some common problems and possible cures.

No communication

- Ensure Ethernet cable is plugged in correctly to unit.
- Ensure Ethernet cable is correctly plugged into an Ethernet switch.
- Ensure port used on the Ethernet switch is PoE enabled and the switch has the corresponding port enabled.
- Check the Ethernet switch indicator lights show correct PoE and link status.

No transmitted audio

- Ensure audio source is powered, correctly connected and producing an audio signal.
- Ensure phantom power and mic line switches are set correctly (InBox X2 only).
- Ensure an InBox is being used.
- Ensure correct audio channels are placed in the transmit bundle.
- Ensure bundle has a number that is correct for its type (multicast bundles should be 1-255).

No received audio

- Ensure an OutBox is being used.
- Ensure corresponding receiver bundle is being transmitted correctly.
- Ensure correct bundle number is being received.
- Ensure required bundle is allocated correct channel numbers (33 through 40)
- Ensure cabling to outputs are connected correctly.
- Ensure audio destination is powered, correctly connected and working.

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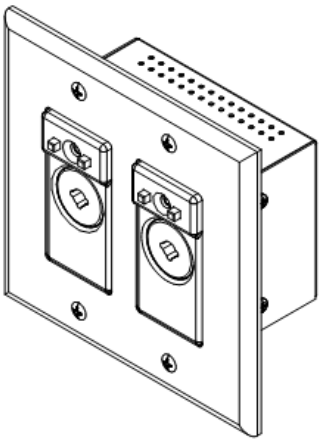
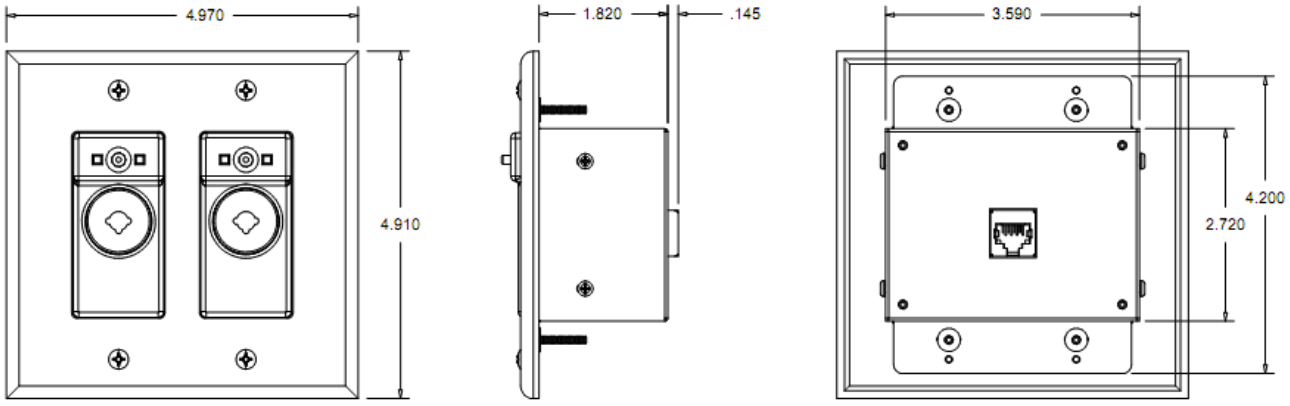
5 – Mechanical layout

All of the following drawings show the devices with the Decora front plate attached.

5.1 – InBox X2





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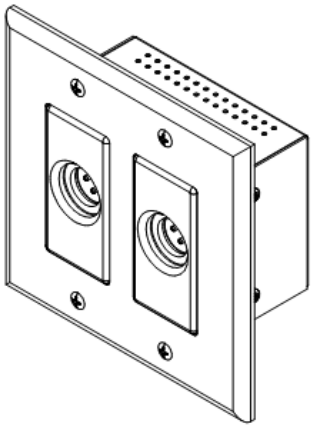
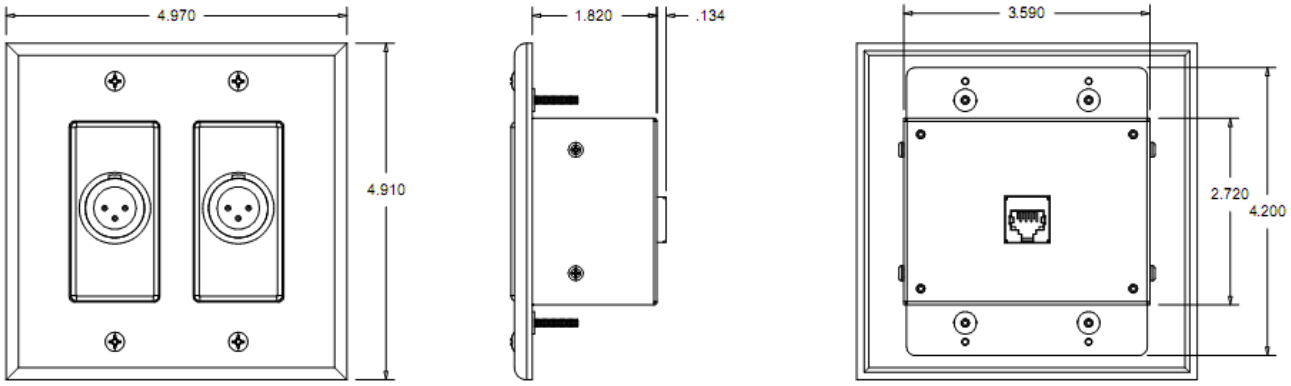
5.2 – OutBox X2





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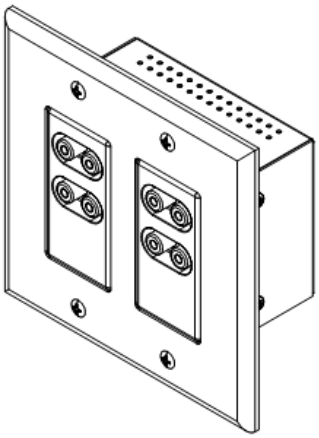
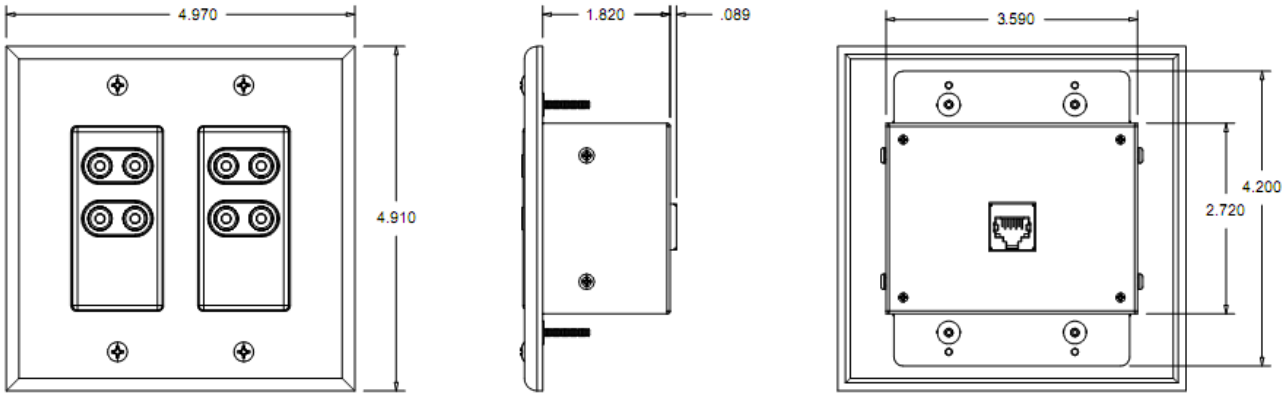
5.3 – InBox R8 / OutBox R8





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6 – ARCHITECTS & ENGINEERS SPECIFICATION

6.1 – InBox X2

The CobraNet interface unit shall provide two mic/line analog inputs on front panel with XLR and TRS connectors. A selectable gain of 0dB, or +30dB and +12V phantom power option shall be provided via front panel switches for each analog input channel. The internal analog to digital signal conversion shall be performed at 24-bit resolution with a sampling frequency of 48 or 96 kHz. The CobraNet Interface unit shall receive power over the Ethernet cable from an 802.3af PoE compliant network switch. The CobraNet interface shall be wall mounted in a standard dual gang junction box.

The CobraNet Interface shall be compatible with Attero Tech Control Center software for flexible control and monitoring in system applications. The CobraNet Interface shall be compliant with the RoHS directive.

The CobraNet Interface shall be the Attero Tech InBox X2.

6.2 – InBox X2 Device Specifications

Audio Inputs

Gain:	Selectable: 0 dB, +30 dB
Input Type:	Balanced and RF filtered
Input Impedance:	Mic: 1 kΩ Line: 37 kΩ
Maximum Input Levels:	+8.2 dBu @ 0 dB gain
Phantom Power:	+12 V, selectable per channel

Audio Performance:

EIN:	-110 dBu
System Noise:	-83dBu @ 0 dB gain, Line Mode
System THD+N:	Mic: < 0.01 % (1 kHz input @ -3 dB below clipping) Line: < 0.006% (1 kHz input @ -3 dB below clipping)
Frequency Response	20 Hz-20 kHz, +/-1dB

CobraNet Network

Physical Level:	Standard Ethernet
Connector:	Single RJ-45
Cable Quality:	CAT-5
Transmission Speed:	100 Mbps

Power Requirements	48V via 802.3af PoE compliant Ethernet switch
Power Consumption	4W
Dimensions	Main Unit: 3.59” x 2.72” x 1.965” (w x h x d)
Weight	0.75 lbs
Compliance	RoHS, FCC Part 15 Class B Compliant

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6.3 – InBox R8

The CobraNet interface unit shall provide eight line level analog inputs on front panel with RCA connectors. The internal analog to digital signal conversion shall be performed at 24-bit resolution with a sampling frequency of 48 or 96 kHz. The CobraNet Interface unit shall receive power over the Ethernet cable from an 802.3af PoE compliant network switch. The CobraNet interface shall be wall mounted in a standard dual gang junction box.

The CobraNet Interface shall be compatible with Attero Tech Control Center software for flexible control and monitoring in system applications. The CobraNet Interface shall be compliant with the RoHS directive.

The CobraNet Interface shall be the Attero Tech InBox R8.

6.4 – InBox R8 Device Specifications

Audio Inputs

Input Type:	Single-ended, RF filtered
Input Impedance:	10 kΩ
Maximum Input Levels:	+8.6 dBu

Audio Performance:

System Noise:	-86 dBu
System THD+N:	< 0.004 % - 1 kHz input @ 3 dB below clipping
Frequency Response	20 Hz-20 kHz, +/- 1 dB

CobraNet Network

Physical Level:	Standard Ethernet
Connector:	Single RJ-45
Cable Quality:	CAT-5
Transmission Speed:	100 Mbps

Power Requirements	48V via 802.3af PoE compliant Ethernet switch
Power Consumption	4W
Dimensions	Main Unit: 3.59” x 2.72” x 1.965” (w x h x d)
Weight	0.75 lbs
Compliance	RoHS, FCC Part 15 Class B Compliant

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6.5 – OutBox X2

The CobraNet interface unit shall provide two balanced outputs on front panel with XLR connectors. The internal digital to analog signal conversion shall be performed at 24-bit resolution with a sampling frequency of 48 or 96 kHz. The CobraNet Interface unit shall receive power over the Ethernet cable from an 802.3af compliant network switch. The CobraNet interface shall be wall mounted in a standard dual gang junction box.

The CobraNet Interface shall be compatible with Attero Tech Control Center software for flexible control and monitoring in system applications. The CobraNet Interface shall be compliant with the RoHS directive.

The CobraNet Interface shall be the Attero Tech OutBox X2.

6.6 – OutBox X2 Device Specifications

Audio Outputs

Output Type:	Balanced with automatic muting upon loss CobraNet signal
Output Impedance:	200 Ω balanced, 100 Ω unbalanced
Maximum output level:	+10 dBu

Audio Performance:

System Noise:	-83 dBu
System THD+N:	< 0.006% - 1kHz input @ -3 dB below clipping
Frequency Response	20 Hz - 20 kHz, +/- 1 dB

CobraNet Network

Physical Level:	Standard Ethernet
Connector:	Single RJ-45
Cable Quality:	CAT-5
Transmission Speed:	100 Mbps

Power Requirements	48V via 802.3af PoE compliant Ethernet switch
Power Consumption	4W
Dimensions	Main Unit: 3.59” x 2.72” x 1.965” (w x h x d)
Weight	0.75 lbs
Compliance	RoHS, FCC Part 15 Class B Compliant

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6.7 – OutBox R8

The CobraNet interface unit shall provide eight single-ended outputs on front panel with RCA connectors. The internal digital to analog signal conversion shall be performed at 24-bit resolution with a sampling frequency of 48 or 96 kHz. The CobraNet Interface unit shall receive power over the Ethernet cable from an 802.3af PoE compliant network switch. The CobraNet interface shall be wall mounted in a standard dual gang junction box.

The CobraNet Interface shall be compatible with Attero Tech Control Center software for flexible control and monitoring in system applications. The CobraNet Interface shall be compliant with the RoHS directive.

The CobraNet Interface shall be the Attero Tech OutBox R8.

6.8 – OutBox R8 Device Specifications

Audio Outputs

Output Type:	Single-ended with automatic muting upon loss CobraNet signal
Output Impedance:	680 Ω
Maximum output level:	+9 dBu

Audio Performance

Noise:	???? dBu
System THD+N:	< 0.007 % - 1 kHz input @ 3 dB below clipping
Frequency Response	20 Hz - 20 kHz, +/- 1 dB

CobraNet Network

Physical Level:	Standard Ethernet
Connector:	Single RJ-45
Cable Quality:	CAT-5
Transmission Speed:	100 Mbps

Power Requirements	48V via 802.3af PoE compliant Ethernet switch
Power Consumption	4W
Dimensions	Main Unit: 3.59” x 2.72” x 1.965” (w x h x d)
Weight	0.75 lbs
Compliance	RoHS, FCC Part 15 Class B Compliant

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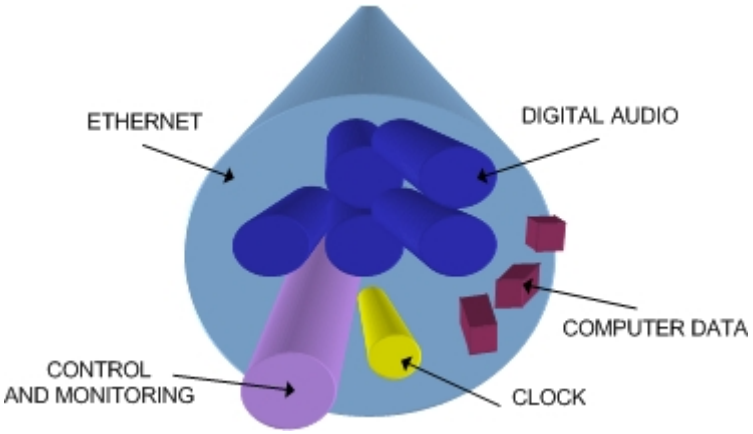
APPENDIX A – Introduction to CobraNet

CobraNet is an audio networking technology for delivery and distribution of real-time, high quality uncompressed digital audio using a standard Ethernet network. It is implemented using a combination of hardware, firmware and the CobraNet protocol.

Unlike other audio networking or distribution technologies, CobraNet is a true network and exists on standard Ethernet networks using standard Ethernet hardware. Since it is a true network, audio routing is highly flexible between network nodes and can be used in a variety of audio distribution applications.

In addition to the high degree of routing flexibility that CobraNet provides, the technology also incorporates the ability to monitor and control CobraNet devices remotely. This is a key feature that is highly important in fixed installation applications where the audio distribution equipment may not be readily accessible. All CobraNet devices on the network can be controlled and monitored from a central location by sending control commands and monitoring device specific parameters.

CobraNet provides this capability by implementing Simple Network Management Protocol (SNMP). SNMP is a standard protocol typically used for monitoring network devices such as Ethernet switches. In the case of CobraNet, it allows users to communicate with any CobraNet device using standard SNMP tools or a customized user interface designed specifically for CobraNet, such as Attero Tech's Control Center application.



The figure above represents the types of data that coexist on a CobraNet network.

Before a CobraNet system can be configured, it is important to first understand how CobraNet distributes audio between devices.

Audio is sent in "bundles" on a CobraNet system. Each bundle is capable of holding up to 8 logical audio channels. Every CobraNet device has a number of bundle transmitters and bundle receivers. These transmitters and receivers are the mechanism used to send and receive bundles between devices.

For a transmitted bundle, audio may be sourced from either the local audio inputs of the device or internal audio from the on-board DSP[2], but not both simultaneously. Combinations of the local or internal audio may exist within a bundle in any order. Additionally, a single source in a device may be used multiple times in a single transmitter bundle or across multiple transmitter bundles. For a received bundle, the received network audio may be routed to the device's local outputs or the internal DSP[2] or simply ignored.

Once the contents of a bundle have been decided, the next step is to pass to another CobraNet device. To do this, every CobraNet device has up to 4 bundle transmitters. Each bundle transmitter has a transmit mode that must first be selected. This affects how many devices may receive that particular bundle at a time. The modes are as follows:

- Unicast – Used for one to one connections. In this mode, only one receiver at a time can receive this bundle. Once a link is established from this transmitted bundle to a receiver, any future requests for that bundle will fail.
- Multicast – Used for one to many connections. This mode broadcasts its contents over the entire network. There is no restriction on the number of receivers. However, the downside is the network bandwidth required.
- Multi-unicasts – Another one to many mode. Whilst this is the most efficient method for getting a bundle to multiple receivers in terms of network bandwidth, it requires more processing power on the CobraNet device so in

[2] Not available on all devices – CS49xxx devices only

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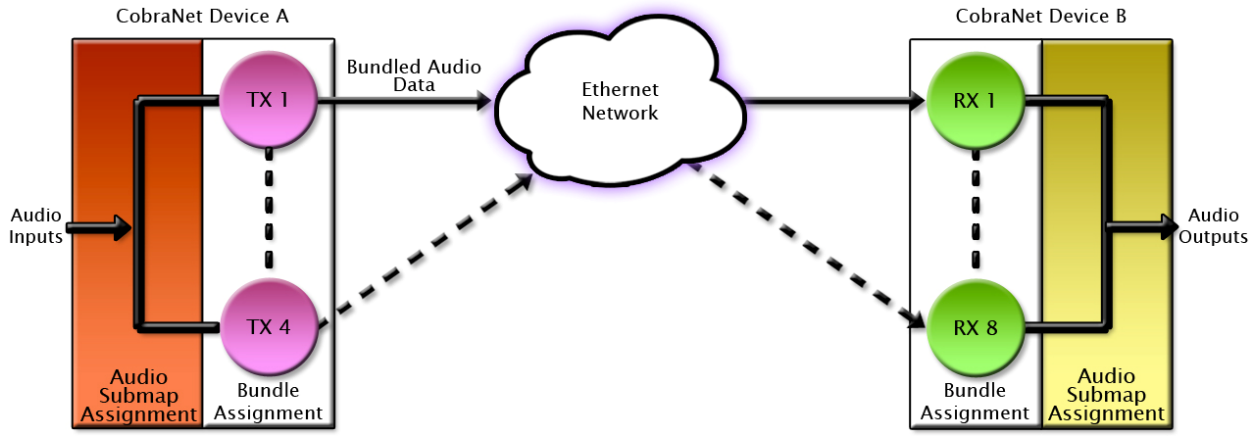
this mode there is a maximum limit of 4 receiver connections (this can be reduced if required). If more connections are required than the limit, the node automatically switches to multicast.

Note: When a bundle must be transmitted to multiple receivers, multi-unicast transmissions should be used where possible.

Once the mode is selected, to enable a device to transmit the bundle, simply allocate the particular transmitter bundle a non-zero number. Since this number identifies all the network packets sent out by that transmitter, each transmit bundle number must be unique on a network[3].



Now the transmitter is setup, it's time to setup the receivers. In order to receive bundles, each CobraNet device has up to 8 bundle receivers. To enable a device to receive a bundle, simply allocate one of that device's bundle receivers the same bundle number as a transmitted bundle. By doing so, a virtual link is created and audio should now be passed from one device to the other. It should be noted that no knowledge of a device's network topology or connection is thus required in order to configure audio connections. The only restriction to this is that a device cannot be setup to receive a bundle it is also transmitting.

The above case creates a simple, one to one unidirectional link. If more devices are required to receive that bundle then allocate the same transmitted bundle number to a bundle receiver on the other CobraNet devices.

It is also important to note that CobraNet also supports simultaneous bidirectional audio distribution in each device as well. Not only could audio be sent from device A to device B but at the same time, should it be needed, audio could also be sent from device B to device A.
The exact bundle and routing configuration will be determined by the needs of each individual installation. An installation may have multiple units transmitting multiple bundles. The only restriction is the bandwidth available on the network to transfer the audio.

CobraNet does more than just transfer audio data. It can be used to pass serial information too. A feature called serial bridging has been incorporated that allows the passage of serial data between nodes. Each node can pass serial data to a specific node or multicast the data to multiple nodes. A node can also receive data from either a single source or multiple sources. Baud rates, data bits, stop bits, parity and so on are all configurable. There is also support for multi-drop serial buses as well.

Finally, CobraNet has the capability to alter all of the above options in real time making the whole system completely dynamic. By use of control software, all of the bundle assignment parameters can be configured with no need to change cables, switch out connectors or pull new wiring. Most importantly, this control capability can be implemented from a single location!

[3] Bundle numbers range from 1 through 65535. A value of 0 represents an inactive bundle. Numbers 1 -255 are also reserved for multicast mode transmissions.

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APPENDIX B – Reference Documents

The following table lists the relevant reference documents.

Document Title
CobraNet Programmer's Reference (Cirrus Logic)
http://www.cobranet.info/en/support/cobranet/design/bundle_assignments.html
Attero Tech Control Center User Manual

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